

KEPCO POWER SUPPLY



news

Latest information on the development and application of Voltage/Current Regulated Power Supplies.

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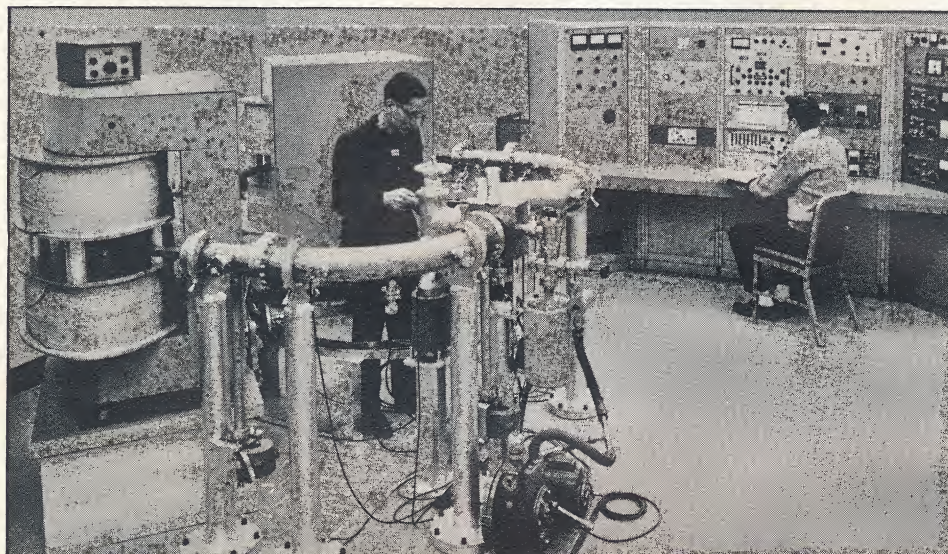
STABLE MAGNETIC FIELD POWER FOR A TANDEM DOUBLE FOCUSSED MASS SPECTROMETER

L. Forman and F. A. White

Department of Nuclear Engineering and Science
Rensselaer Polytechnic Institute; Troy, New York

Submitted through:

Mr. O. L. Casstevens
Naco Electronics Corp. Syracuse, N.Y.



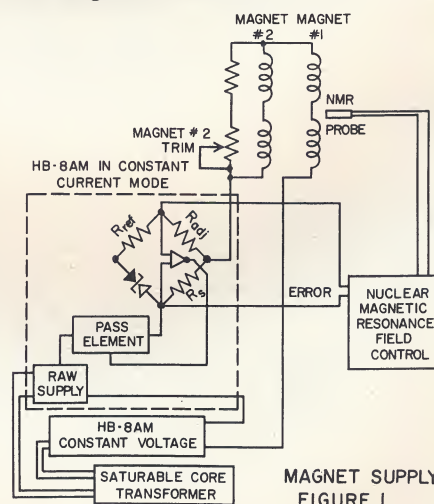
A high precision research instrument comprised of four analyzing elements in tandem has recently been completed. This new mass spectrometer includes two 5-ton 20 inch radius of curvature magnets, two 20 inch radius of curvature electrostatic lenses, a 24-stage electron multiplier, multiple defining slits, and five ion-type vacuum pumps. The use of two large electromagnets in series produces greater resolution and sensitivity in isotopic abundance measurements than attainable in conventional single magnet mass spectrometers. It is the first of several major instruments which will be included in the stable-isotope and ion physics laboratory at Rensselaer.

The tandem magnetic analyzer demands a number of power and stability criteria:

1. Minimal differential drift of the separate magnets.
2. Independent control of one of the magnets.
3. Low exciting coil temperature effects.
4. Long term stability to 500 parts per million.
5. Continuously variable current control in a wide range.

The magnetic power supply system which fulfills these requirements is shown in Figure 1. Kepco Model HB-8AM supplies are arranged in a series constant current-constant voltage mode. The net effect is a continuously variable constant current supply. As the same source powers both of the magnets, differential drift is mini-

mized. Temperature effects are small because the Kepco Model HB-8AM power supplies have a low temperature coefficient, and the ambient temperature of the exciting coils is negligibly greater than room temperature since only 300 milliamperes is required through the exciting coils for a magnetic field of approximately 3 kilogauss. Independent magnet control is obtained by a separate magnet trim on the second magnet. It was found that a 1% change in magnet #2 affected the first magnet by less than one part in 10^4 .



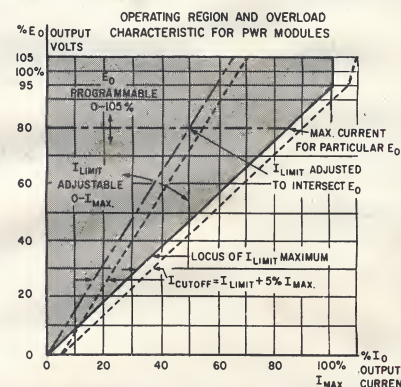
Long term stability is enhanced through the use of a nuclear magnetic resonance field control unit in a feedback control loop with the magnet power supplies.

Continued on Page 2 - Col. 3

UNUSUAL PWR MODULE

Unique Cut-Off Characteristics and Full Range Programming Increase Utility of the PWR Highly Regulated High Power Module

A power supply which cuts-off on overload provides unique protection for the load as well as for the power supply itself. When this type of characteristic is combined with full range programmability and precision line and load regulation, a most useful high power module is provided to the user. The current cut-off may be set at any value from maximum rating to substantially zero. When any voltage below maximum is programmed, the current cut-off automatically tracks to provide proportional protection.



I_{LIMIT} IS THE MAXIMUM OPERATING CURRENT FOR ANY SELECTED CUTOFF CURRENT. I_{LIMIT} IS APPROXIMATELY EQUAL TO I_{CUTOFF} MINUS 5% I_{MAX} .

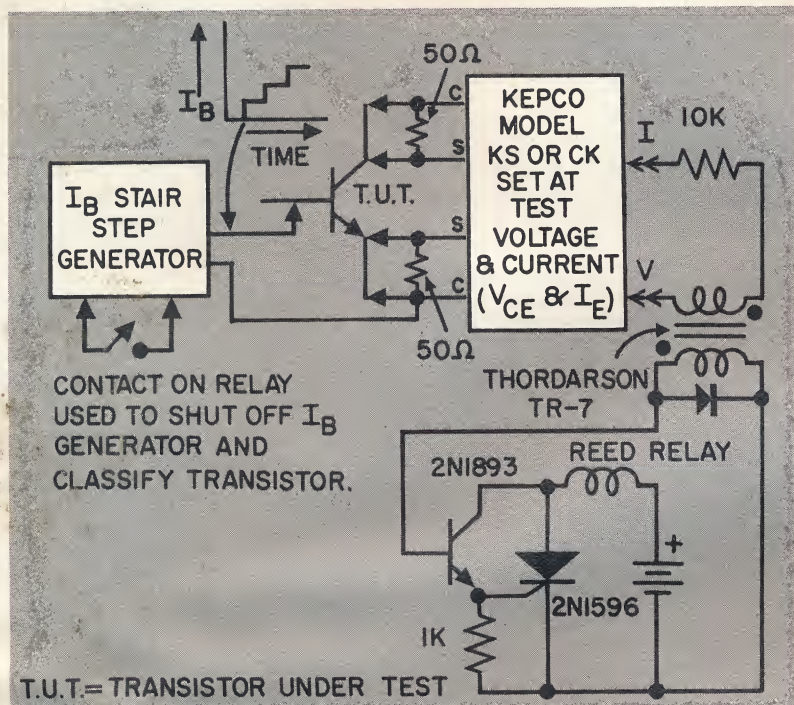
While all this may sound complicated, it can readily be seen and explained by reference to the diagram of operating characteristics. At any point within the operating area, any current cut-off may be set which exceeds the desired maximum current by at least 5% of the rated maximum. In response to an overload, the current will automatically program downward along a line parallel to the overload characteristic line to a final current of the order of 5 percent of maximum rated current. In other words, the current into a short circuit will be only 5 percent of the maximum rated current. In addition, from any chosen operating

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MONEY SAVED BY USE OF KEPCO VIX®EQUIPPED POWER SUPPLIES



Texas Instruments claim saving over \$400.00 per station by using Kepco VIX Power Supplies of the CK or KS Design Groups in an automated transistor classifying system. The VIX Power Supplies perform the functions of more complicated and costly components formerly used.

The VIX Power Supply is an automatic crossover power supply incorporating two regulating circuits, one for voltage and the other for current. When such a power supply is connected to a load, its mode of operation (voltage regulating or current regulating) depends on the voltage setting, the current setting and the load resistance. Transition from one mode to the other is automatic at the automatic crossover point where the load resistance equals the regulated voltage divided by the regulated current. When this crossover takes place in a VIX Power Supply, an output signal is generated which may be used for automatic control functions.

In the present application, the VIX Power Supply is used to supply collector voltage and current to a transistor to be classified in accordance with its h_{FE} (DC beta). A suitable regulated voltage and a predetermined regulated current is set up in the power supply. When current is applied to the base of the transistor, the power supply operates in its voltage regulating mode until the base current times h_{FE} equals the predetermined regulated current at which point the power supply crosses over and puts out a VIX signal. This signal is used to operate a relay which in turn controls the automatic sorting mechanism.

The figure shows the actual set up used by Texas Instruments in their automatic classifying system for transistors. A stair step generator applies steps of known current to the base of the transistor being classified. The Kepco CK or KS power supply is set at the test voltage (V_{CE}) and test current (I_C). When the base current exceeds the value I_C/h_{FE} , the power supply will switch from voltage to current regulating mode. When this crossover occurs, the VIX output pulse is applied to the 2N1596 controlled rectifier which activates a reed relay.* A contact on this relay then shuts off the base current step generator and classifies the transistor. A transformer TR-7 is provided for isolation and a transistor (2N1893) is used to provide sufficient current to turn on the 2N1596 relay drive controlled rectifier. For high values of I_C , remote sensing of the power supply output at the transistor under test is recommended to assure accurate functioning at the crossover.



This article is based on an application of Kepco VIX Power Supplies submitted by Mr. Charles Mayo Neal, Design Engineer at the Semiconductor Division of Texas Instruments, Inc., Dallas, Texas through Kepco Engineering Representative, Mr. Byrt Scammel of Airep Engineering Company, Dallas 14, Texas, Phone (214) TA4-3800.

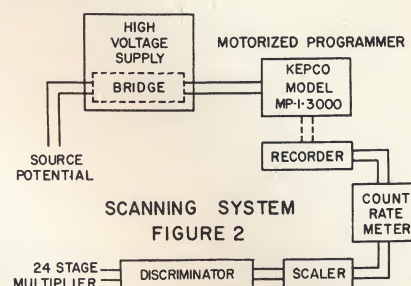
*Ed Note: Kepco supplies the Model VIX-1 to provide three heavy duty contact closures from the VIX signal. Ideal for those who don't wish to "roll their own."

Kepco is pleased to publish notes, circuits and suggestions contributed by our customers. Publication does not, however, constitute endorsement. Other circuits which have been developed will be published in future issues.

MASS SPECTROMETER

Continued from Page 1 - Col. 1

This proved to be unnecessary for most applications because the long term stability of the Kepco HB-8AM supplies was sufficient.



Mass scanning is obtained by keeping the magnetic field constant and changing the accelerating potential. A Kepco Model MP-1-3000 programmer is used to adjust the source accelerating potential in a continuous manner. Figure 2 shows the scanning system which is used to record count rate as a function of accelerating potential.

UNUSUAL POWER MODULE

Continued from Page 1 - Col. 2

voltage and current point, the voltage and the corresponding current can be programmed linearly and proportionally to essentially zero. For a resistive load, the current will automatically follow the PWR cut-off curve as voltage is programmed.

The following are the essential specifications of the PWR Design Group of High Power Modules.

Voltages and Currents: Six combinations of voltage and current from 12 volts at 0-7 amperes to 60 volts at 0-1.5 amperes. All voltages programmable to zero with proportional reduction in maximum current.

Line Regulation: Less than 0.005% output voltage change for 100-130V AC variations.

Load Regulation: Less than 0.05% output voltage change or 1 mv, whichever is greater, for no load to full load change.

Stability: Output varies less than 0.05% or 3 millivolts, whichever is greater, over a period of 8 hours after warmup (measured at constant line voltage, load and ambient temperature).

Ripple: Less than 0.25 millivolts rms.

Recovery Time: 50 microseconds.

Temperature Coefficient: Output voltage changes less than 0.05% per °C.

Ambient Operating Temperature Range:

– 20°C to +65°C uncased

– 20°C to +55°C cased

Full Range Programmable, Remote Error Sensing and Overload Cutoff are important additional features.

All Silicon Design – Modular Package

For complete specifications write Kepco, Inc. or their Representatives throughout the U.S., Canada and Europe.

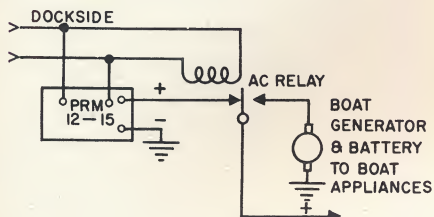
UNUSUAL APPLICATIONS OF REGULATED POWER SUPPLIES

Imaginative applications of regulated direct current or voltage can stimulate the imagination and help to solve your own unusual problem. A group of Kepco Sales Engineers were recently asked "What was your most interesting or unusual application of Kepco Power Supplies during the past year?" Here are some of the answers:

12 VOLT DC BOAT APPLIANCES OPERATED FROM DOCKSIDE 115VAC POWER

By Mr. Mike Beck
Lee Associates,
Rockville, Maryland

Problem: To supply 12 volt DC power to boat equipment when at dockside. This equipment normally is powered from 12 volt storage batteries.

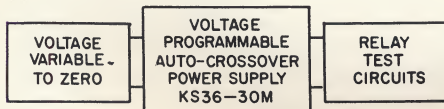


Solution: A Kepco PRM 12-15 supplies all 12 volt equipment at currents totaling up to 15 amperes from the 115VAC dock side power. An AC Relay makes the switch-over automatically when 115VAC power is connected.

TRUE ZERO CURRENT INTO A SHORT CIRCUIT

By Mr. G. H. Drysdale,
The Satullo Co.,
Cincinnati, Ohio

Problem: To supply zero to 25 amperes current at zero to 30 volts in study of relay contact life and effects of varying contact material.

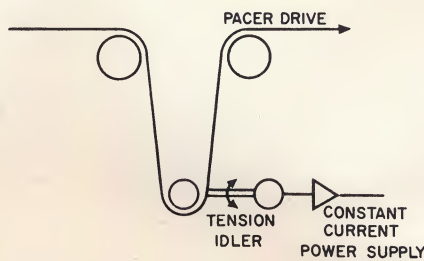


Solution: Voltage programming of a KS36-30M power supply. (0-36 volts at 0-30 amperes voltage and current regulated with automatic crossover). The voltage programming of output current provides a range of outputs which include true zero current at zero programming voltage. Conventional current programming methods cannot provide operation at zero output current. "As far as we know no one else talks about programming in a constant current mode to zero current through a short circuit."

CONSTANT TORQUE WITH CONSTANT CURRENT POWER SUPPLY

By Mr. Earl Chiswell,
E. C. Electronic Sales,
Minneapolis, Minn.

Problem: To provide constant torque in a web transport using servo drive supply to DC torque motors.



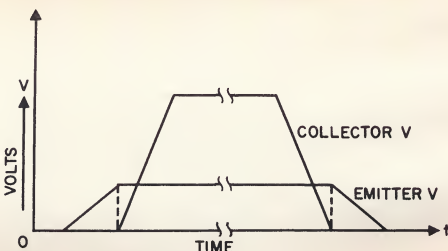
Solution: Unipolar constant current supply for the tensioning portion of the control (Kepco KS 36-10M).

POWER APPLIED TO TEST RACKS CONTROLLED BY KEPKO MPI-3000 MOTORIZED PROGRAMMER

By Mr. Sam Spivak,
Eastern Instrumentation, Inc.,
Great Neck, N.Y.

Problem: To apply sequenced test voltages first to emitters and then to collectors in transistor test racks. Also to remove the voltages in reverse order.

A similar problem was to ramp up about 20 different voltage levels without turn on surges to test various capacitors.



Solution: The voltages were programmed with Kepco Motorized Programmer MP1-3000 at desired rate and in desired sequence.

PHOTO-MULTIPLIER TUBE OPERATION AT CRYOGENIC TEMPERATURES

By Mr. William Peak
Lee Associates,
Huntsville, Alabama

Problem: Operation of a photo-multiplier tube at cryogenic temperatures which requires very low ripple at voltages up to 2500 volts.

Solution: The Kepco ABC 2500 was found to be highly satisfactory although a much higher priced supply had originally been specified. The ABC 2500's ripple was well below what could be tolerated.

HIGH SPEED RESPONSE POWER MODULE NOW AVAILABLE NEW 50,000V/sec. PROGRAMMING SPEED

A Kepco advance in modular power supply design offers an option of high speed or standard programming response made possible by a choice of plug-in regulators. The new HS (high speed) regulator provides 50,000 volts per second slewing speed. This is made possible largely through increased amplifier and output circuit bandwidth. Since the standard PAX module regulator slews at 200-500 volts per second, the PAX-HS represents better than 100 to 1 increase in the speed of response. This high speed programmability is most useful in many applications where the PAX module is used as a functional element in a feedback control or similar system.

High Speed (PAX-HS) Characteristics operationally programmed:

Unity gain bandwidth: 100kc,

slope: -6db per octave.

Open loop DC gain: >80db

Maximum slewing rate: 50,000 volts/sec.

Maximum capacitive loading: 0.001μf

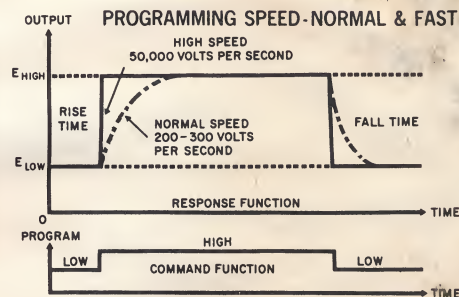
Ripple: 5 mv rms.

AC output impedance: 1 kc-100kc:

0.02 ohm + 15μh

Frequency response: $f_{max} = \frac{50,000}{\pi E_{pp}}$

(E_{pp} is the sinusoidal peak-to-peak voltage excursion)



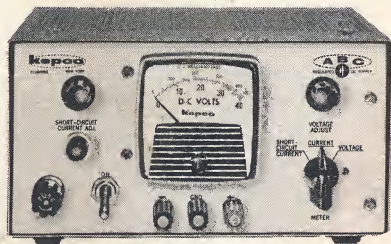
0.05% REGULATION & STABILITY

MODEL	DC OUTPUT VOLTS	DC OUTPUT AMPS	PRICE
PAX 7-1	0-7	0-1	\$ 79.00
PAX 7-1HS	0-7	0-1	89.00
PAX 15-0.75	0-15	0-0.75	79.00
PAX 15-0.75HS	0-15	0-0.75	89.00
PAX 21-0.5	0-21	0-0.5	79.00
PAX 21-0.5HS	0-21	0-0.5	89.00
PAX 36-0.3	0-36	0-0.3	79.00
PAX 36-0.3HS	0-36	0-0.3	89.00
PAX 72-0.15	0-72	0-0.15	79.00
PAX 72-0.15HS	0-72	0-0.15	89.00
PAX 100-0.1	0-100	0-0.1	79.00
PAX 100-0.1HS	0-100	0-0.1	89.00

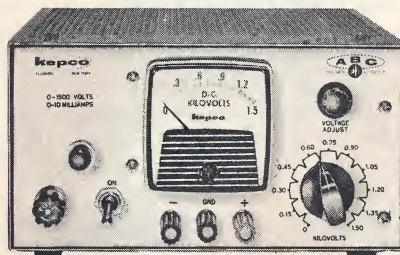
Plug-in high speed regulators are available to convert standard PAX modules to the high speed option.

For complete specifications write Kepco, Inc. or their local Representatives.

10-TURN CONTROL NOW STANDARD ON ENTIRE ABC DESIGN GROUP



Model ABC 30-0.3M



Model ABC 1500M

Now the entire ABC Design Group of low cost voltage/current regulated programmable power supplies are equipped with 10-turn controls as standard equipment. These ABC's are the only regulated power supplies in their price range so equipped. While the advantages of this type of control are many, and some are obvious, it may be informative to discuss them in some detail.

First, the entire ABC Design Group numbering 13 models is provided with 10-turn voltage controls as standard equipment at *no increase* in price. Thus, a substantial increment in value over competitive supplies has been provided.

Second, the time saved in making adjustments with the high resolution and continuous variation provided by the 10-turn control is substantial. Since one of the basic functions of an instrument is to save time, this facility adds directly to the value and usefulness of the ABC power supply as a laboratory instrument. In line with this time-saving ability is the convenience of having just one knob to adjust even while making the most critical settings. Further, the single knob provides an unambiguous high resolution setting with no possibility of disturbing the setting of a second knob as is the case with the lower cost dual concentric vernier controls used on many competitive models.

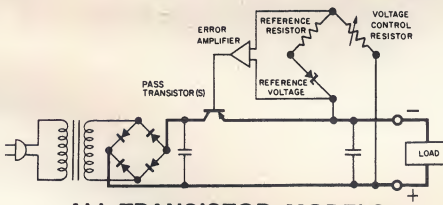
Third, the availability of 10-turn controls in the lowest compatible temperature coefficient wire is important since the voltage control in any power supply is one of the critical determining factors in its regulator. In the ABC design, the output voltage is directly proportional to the resistance of this control and hence its temperature coefficient is most important if a high degree of stability is to be attained and maintained. The temperature coefficient of the wire used in the 10-turn controls lies in the range of 20 to 60 parts per million depending on the resistance range. This leads to Kepco's unique ability to specify the temperature coefficient and stability for its equipment using the panel controls. There is no fine

print requiring external precision (stable) programming resistors in order to meet advertised temperature coefficient and stability specifications.

Fourth, the multi-turn control has been extensively developed over the past several years into a reliable precision device with long life expectancy. The mechanical construction is superior and the resulting operation is smooth, easy and highly accurate. The advantages provided by this intensive development is added to the other important features of the ABC Design Group.

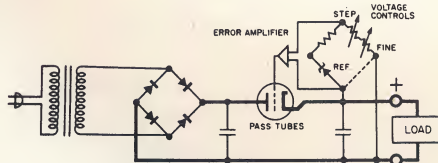
While the ABC Design Group power supplies have enjoyed great popularity in the past due to their many desirable characteristics, convenience and low price, the provision of a 10-turn control as standard equipment for all models can only help to make them even more useful and popular in the laboratory, on the test bench and in systems.

0.05% REGULATION & STABILITY



ALL-TRANSISTOR MODELS

MODEL	DC OUTPUT RANGE		PRICE (metered)
	VOLTS	AMPS	
ABC 2-1M	0-2	0-1	\$119.00
ABC 7.5-2M	0-7.5	0-2	159.00
ABC 10-0.75M	0-10	0-0.75	119.00
ABC 15-1M	0-15	0-1	159.00
ABC 18-0.5M	0-18	0-0.5	119.00
ABC 30-0.3M	0-30	0-0.3	119.00
ABC 40-0.5M	0-40	0-0.5	159.00
ABC 100-0.2M	0-100	0-0.2	179.00



HYBRID MODELS

ABC 200M	0-200	0-0.1	199.00
ABC 425M	0-425	0-0.05	199.00
ABC 1000M	0-1000	0-0.02	274.00
ABC 1500M	0-1500	0-0.01	274.00
ABC 2500M	0-2500	0-0.002	334.00

Write for complete specifications.

GLOSSARY OF POWER SUPPLY TERMS

Communication within a technical field and between it and other fields is important to the maximum utilization of its technology. Rapid and accurate communications require utilization of terms with particular meanings. Kepco Power Supply News regularly publishes in this column a number of definitions of terms peculiar to the regulated power supply art in an effort to improve understanding and to facilitate communications within and without the power supply field.

PROGRAMMING:

The control of any power supply functions, such as output voltage or current, by means of an external or remotely located variable control element. Control elements may be variable resistances, conductances, or variable voltage or current sources.

RECOVERY TIME:

(Current Regulation):

Specifies the time needed for the output current to return within the regulation specification after a step load or line change. For load change, current will recover at a rate governed by the rate-of-change of the compliance voltage across the load. This is governed by the RC time constant of the output filter capacitance, internal source resistance and load resistance.

RECOVERY TIME

(Voltage Regulation):

Specifies the time needed for the output voltage to return to a value within the regulation specification after a step load or line change. Recovery time, rather than response time, is the more meaningful and therefore preferred way of specifying power supply performance, since it relates to the regulation specification.

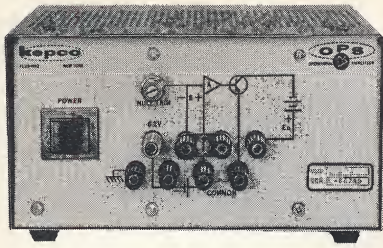
VIX INDICATORS:

Voltage/Current Crossover Indicators. VIX indicators are a pair of small mode lamps on the front panel of automatic crossover power supplies. One lamp lights during voltage regulated operation of the power supply; the other lamp lights during current regulated operation.

VIX SIGNAL:

A keyed voltage, whose polarity is an indication of power supply output voltage/current regulation mode. The polarity abruptly reverses at the crossover point and can be used to actuate external mechanisms such as lamps, alarms, etc.

INSTRUMENTATION WITH OPERATIONAL POWER SUPPLIES



Model OPS-1A

The Kepco OPS-1 (operational power supply) is a new generation electronic device. A cross between a well regulated DC power supply and the ubiquitous operational amplifier, it combines their diverse features to create a brand new operational tool for the systems designer. In recent years, DC regulated power supplies have grown increasingly versatile in their programming capabilities. Supplies employing the exclusive Kepco bridge regulator are among the most flexible. They can be controlled by means of remote resistances (directly or inversely), by voltages, currents or combinations thereof. An operational analysis of the various programming modes yields a valuable insight into the systems capabilities of the modern DC regulated power supply. For example: resistance programming can be described as an amplifier functioning with a fixed input (reference) and a variable gain; while, on the other hand, voltage programming consists of a variable input to a fixed gain amplifier.

Operationally programmed DC power supplies find application in many control fields, notably, temperature, speed, light, chemical action and the like. The combination of a high gain, very high power amplifier in a self-sufficient package offers many unique advantages over comparable DC amplifier systems. These same advantages are also useful in signal processing applications such as might be found in any control loop, integrators, summers, translators, impedance transformation and the like. Thus was born the OPS-1 which combines in a single package, the high gain voltage amplifier found in Kepco's CK/KS power supplies, a small (1 watt) power stage, and all supporting power supplies.

OPS-1 is, in effect, a miniature DC power supply/operational amplifier, requiring only connection to any 115/230 50-400 cps AC power source, and providing a three terminal inverting amplifier with 80 db open loop gain, 200kc unity gain bandwidth and 100,000 volt/second output slewing capability. OPS-1 produces a unipolar 0-20V output at 0-50 milliamperes, current limited (adjustable) for full overload protection. All input and feedback elements are connected externally, their choice depending on the nature of the task at hand. A built-in (-6.2V

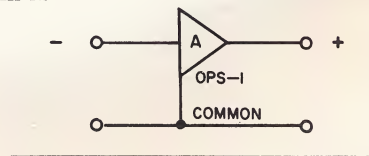
zener regulated) voltage reference supply facilitates biasing operations and permits operations as a voltage/current source in the manner of a power supply. While OPS-1 is particularly designed for use with Kepco operationally programmable power supplies in signal processing, translation and driving functions, it is equally adaptable to almost any operational amplifier computational function, especially those requiring a relatively high level output. Where only a few amplifiers are needed, the self-contained OPS-1 eliminates the need for auxiliary power supplies, reference sources, boosters, interconnecting cables, mountings and the like.

Typical applications include:

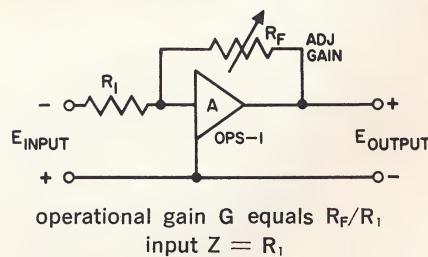
1. Precision nulling voltage reference.
2. Programmable voltage or current source.
3. Standard cell repeater.
4. DC impedance transformer (high to low).
5. Buffer amplifier for potentiometric dividers.
6. Potentiostat signal repeater (electrochemistry).
7. Adjustable gain DC instrumentation amplifier.
8. Recorder amplifier/driver.
9. Meter amplifier.
10. Photocell amplifier.
11. Resistance-to-voltage translator for thermistors and photo resistors.
12. DC servo amplifier.
13. Integrator.
14. Summer (all operational algebraic manipulations).
15. Analog simulation and problem solving.

The following diagrams illustrate some of the basic OPS-1 connections:

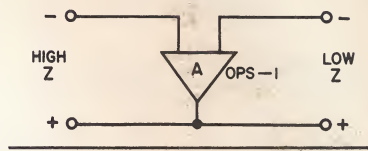
The OPS-1 is represented schematically as a high gain inverting amplifier with gain A:



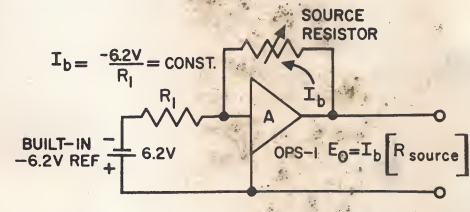
Operationally, connected as a conventional amplifier, the OPS-1 circuit resembles that of an operational amplifier:



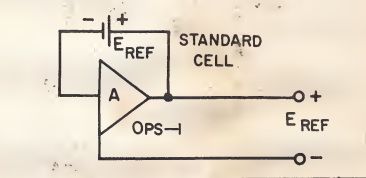
As an impedance transformer, OPS-1 is connected as a unity gain, non-inverting amplifier:



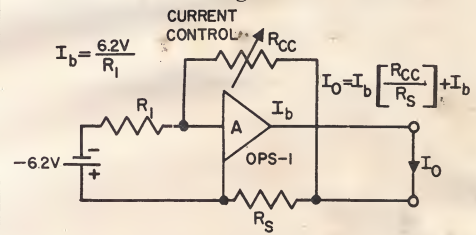
As a resistance-to-voltage translator, OPS-1 uses its built-in reference to supply a (selectable) constant current to the source resistor. The output voltage is the product of this current times the source resistance. The output voltage is thus linearly related to resistance:



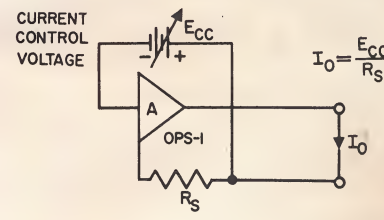
Standard cell repeater:



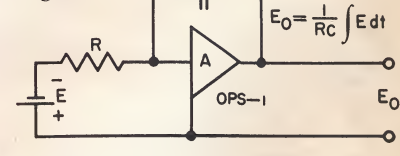
Current source using built-in reference:



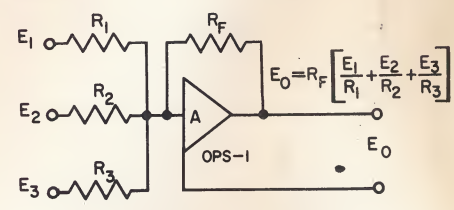
Current source controlled by voltage ECC:



Integrator:



Summer:



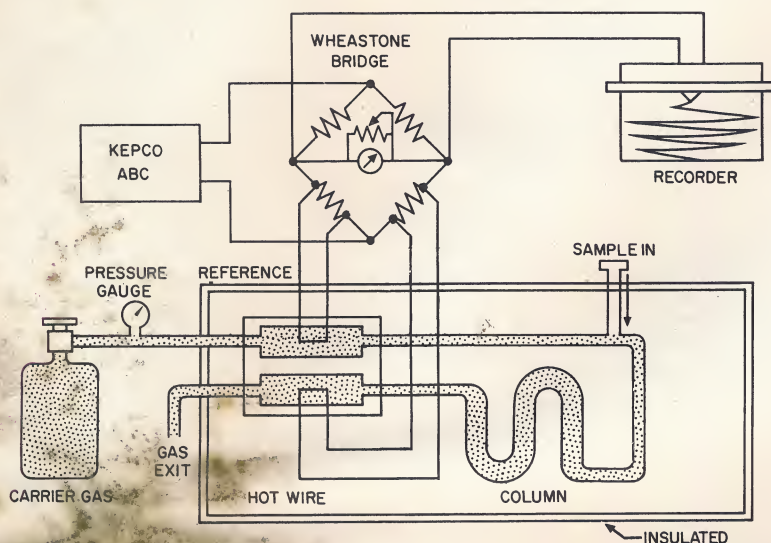
OPS-1 is available in two kinds of housings (or by itself, uncased for build-ins).

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ABC POWER SUPPLIES WELCOMED BY GAS CHROMOTOGRAPH USERS

By Mr. Bill Peters,
Electrical Engineering Department,
Rice University, Houston, Texas

Submitted through:
Mr. Fred Troegel
Airep Engineering Co., Houston, Texas



The use of gas chromatography has literally mushroomed into an important analytical tool for chemists. The electronic heart of these analyzers is the detector which must be maintained at a very stable temperature in order to detect the various constituents entrained in the carrier gas. A Wheatstone bridge circuit is most commonly used as a detector with a hot wire as one arm of the bridge. A specially designed column causes the constituents in the carrier gas to move at different speeds across the hot wire thus allowing the bridge to register the thermal conductivity of each constituent as a change in resistance. Since these instruments are capable of detecting a change of a few parts per million, it is imperative that the current applied to the detector be from a very clean and stable DC source.

Regulation and stability of the DC source is a point of keen interest for Kepco DC power supplies. The DC source for the chromatograph is usually designed for battery operation. Sometimes the manufacturer builds in a regulated DC power supply which may or may not be listed as an option.

Batteries are not completely satisfactory from the point of view of the user, because they are only a temporary source of power at best, and their continuously depleting energy level causes constant concern about data consistency.

If the manufacturer includes a DC supply with his chromatograph, it is most likely that this option, if it is an option, costs on the order of twice the price of a Kepco ABC yet will have poorer regulation, poorer stability, and usually lack the very pertinent current limit feature of the ABC's which save the detectors

from burning out due to unexpected overloads.

The biggest users of the ABC group of supplies for gas chromatography are in petro chemical refineries, research, chemical engineering and chemistry departments, medical colleges and hospitals and the food industry.

The most common types of chromatographs encountered are:

1. Hot wire detectors requiring approximately 12V at 300ma. Here the ABC 15-1M is a good choice not only because it fits the requirements but because it is capable of powering two units simultaneously.
2. Thermistor type units which commonly pull 12V at 30ma.
3. Hydrogen flame units where requirements are met by the ABC 425M.
4. Ionization type chromatographs where high voltage and low current demands may be supplied by the ABC 1500M.

The Kepco ABC group of supplies has indeed been met with open arms by chromatograph users. Manufacturers are now evaluating the newly announced, highly regulated but low cost PAX group of Regulated Power Supplies.

OPERATIONAL POWER SUPPLY

Continued from Page 5 - Col. 3

OPS-1A is the bench housing, an attractive 4 1/4" H x 8 5/8" W x 5 5/8" D enclosure illustrated in the photograph. The OPS-1A can also be rack mounted using accessory rack adapters RA 4 or RA 5.

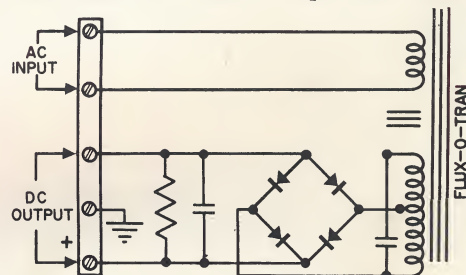
OPS-1B is the mounting configuration designed for plug-in systems applications. OPS-1B fits the standard Kepco Rack Enclosures used with the popular PAX Modules; RA 6-6 and RA 7-4. Prices: OPS-1: \$129.00. 1A and 1B: \$169.00.

News TO THE PRESS

FIXED VOLTAGE PRM MODULE LINE EXTENDED

The PRM 180 Series fixed voltage line regulated power modules previously announced are manufactured in 9 popular voltages from 6.3 to 120V. A new series designated as PRM 120 Series is similar except that the current ratings are somewhat lower. Operating characteristics are similar in both series. The lower price of the PRM 120 Series provides greater economy in applications which do not require the full power of the 180 Series. The PRM 180 Series is packaged in the size "A" package: 6 3/4" H x 4 3/4" W x 10 3/8" D, available with or without case. The new PRM 120 Series is packaged in the new low profile Size "B" enclosure combining case and chassis into one functional housing, 3 1/2" H x 5" W x 13" D.

Reliability is due to basic design simplicity. The major components include the Flux-O-Tran® line regulating transformer delivering a regulated square wave to silicon rectifiers, and a capacitive filter.



Flexibility and convenience of mounting lend to the utility of this compact power source. Rack adapters are available providing mounting of 1, 2, 3, 4 or 5 units on a single panel.

Some of the numerous applications for this economical source of DC power are as follows:

Industrial Uses: relay power, computers, data processing devices and systems, and a wide variety of office machines.

Communication Uses: vacuum tube heaters, telephone systems, mobile radio operation and testing, radio and TV studio and microwave devices and systems.

Testing Applications: aging racks, production line and bench testing.

Battery Substitutes: in unattended locations and on laboratory benches. The PRM modules are particularly useful for multiple voltage applications as in rack equipment, air traffic control and OEM "built-in" chassis mounted devices and systems.

For complete specifications and prices, write to:

KEPCO, INC.
131-38 SANFORD AVENUE
FLUSHING, NEW YORK 11352